

Supplementary file 1. Details of model selection approach

To build a multivariate model of a selected subset of available variables, initially the $S_{KM}(t)$ Kaplan-Meier estimates of the survival curves were calculated for patient groups of a given value for each variable and log-rank tests were used for comparison. Radiotherapy as a prognostic factor was discarded from the analysis on the basis of its controversial effects on survival, as it is usually only administered to patients of better general condition. Proportional hazard (PH) assumption was verified for each investigated variable by visually inspecting the $-\log(-\log(S_{KM}(t)))$ transformations of the estimated survival curves. Whenever the number of variables satisfying the PH assumption was insufficiently low (less than five), we refrained from fitting a multivariate model. Model selection was performed following the general guidelines of Collett^{S1}. A subset of variables was selected for initial model building with a multivariate Cox PH model that both satisfied the PH assumption and had a log-rank p-value of 0.25 or smaller. Variables of similar origin (for example PD-1 IC groups of different threshold values) were narrowed down so that only one of them (the most significant with valid PH assumption) would be included in the model. The resulting model was further refined by excluding terms in a stepwise manner while ensuring that the AIC (Akaike information criterion) value did not increase by more than 10% in the given step. Finally, variables not significant on their own (but meeting the PH assumption) were added one by one to the model to see if they decrease the AIC value. The resulting models for OS and survival from brain metastasis surgery are presented in Table 4.

References

S1. Collett D. *Modelling Survival Data in Medical Research*. London: Chapman & Hall; 1994.